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3FGL J1544.6-1125: radio imaging analysis of newest transitional millisecond pulsar

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Recently, Bogdanov & Halpern (2015) identified the unassociated Fermi gamma-ray source 3FGL˜J1544.6 − 1125 as only the 4th known "transitional millisecond pulsar" (tMSP), a claim further bolstered by follow-up observations by Bogdanov (2015). The tMSPs are a newly discovered class of binary systems that transition between states as a radio millisecond pulsar and a low-mass X-ray binary (LMXB). In the LMXB state tMSPs show X-ray variability over ˜10 − 100s, switching between 'high' and 'low' luminosity modes, as well as infrequent 'flares'. In the high mode, coherent X-ray pulsations are seen, indicating channeled accretion onto the neutron star surface despite the very low accretion rate, and offering the potential to study very low-level accretion onto neutron stars. A coordinated radio/X-ray campaign undertaken for PSR J1023 + 0038 showed that this tMSP is much brighter in radio than expected, and with rapidly variable and flat spectrum continuum emission most likely associated with compact, self-absorbed jet (Deller et al. 2015). This strongly hints at radiatively inefficient accretion flow where majority of accretion energy goes into an outflow. 3FGL J1544.6 − 1125 is currently the only other system in the right state for detailed observations to confirm whether efficient jet formation is common to all tMSPs, and would add a 4th important data point to the newly hypothesized radio/X-ray luminosity relationship for tMSPs. We have therefore observed it with VLA four times over the period of several weeks. Preliminary results indeed show a behaviour similar to J1023, further strengthening the case for 3FGL J1544 being a tMSP. I would be presenting results from this first ever observational campaign to detect the source in radio.

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